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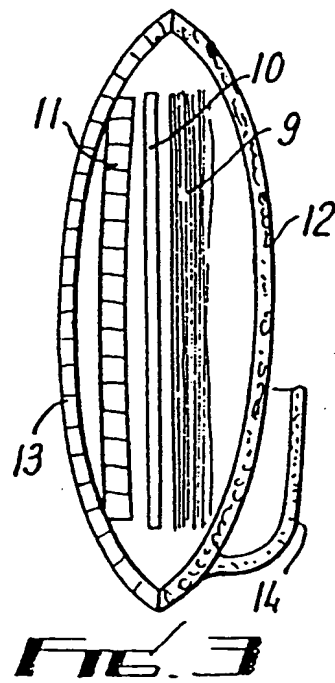
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(54) Protective garments

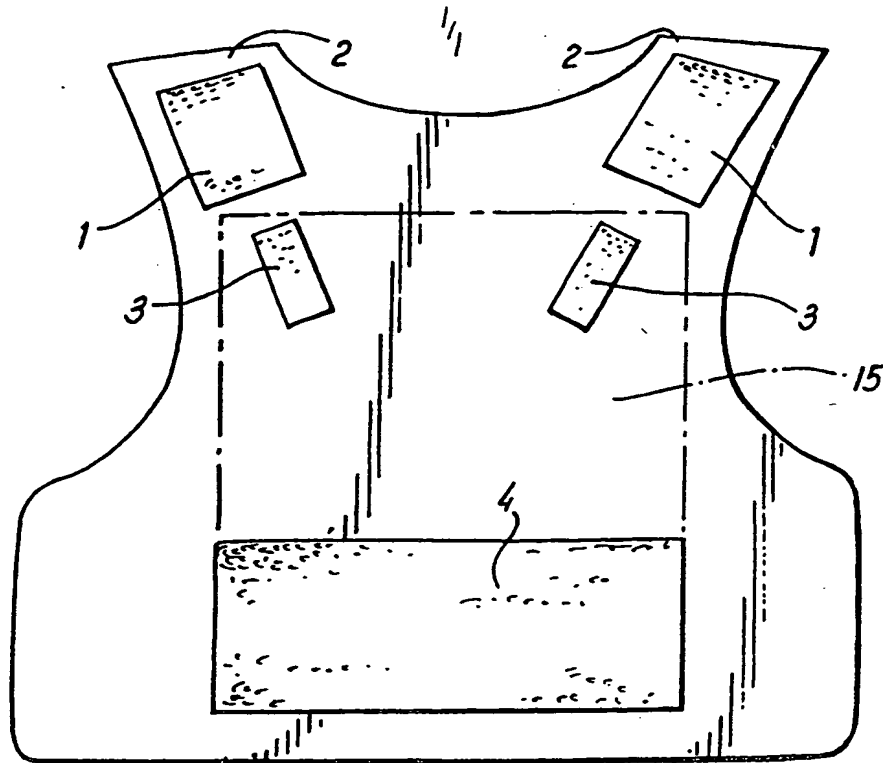
(57) A protective garment of the bullet proof vest kind has layers of a penetration-resisting fabric 9, such as aramid fabric, within an outer cover. The cover has an open-work structure 13 (open mesh/nylon fabric) to permit water drainage and a sheet 11 of buoyancy material (e.g. foamed plastics) is included within the cover. The cover also contains a trauma pack 10. An open-topped pocket (4, Fig. 1) can be provided at a bottom part at the front of the vest to receive a rigid shield (15) a major part of which projects upwards out of the pocket.



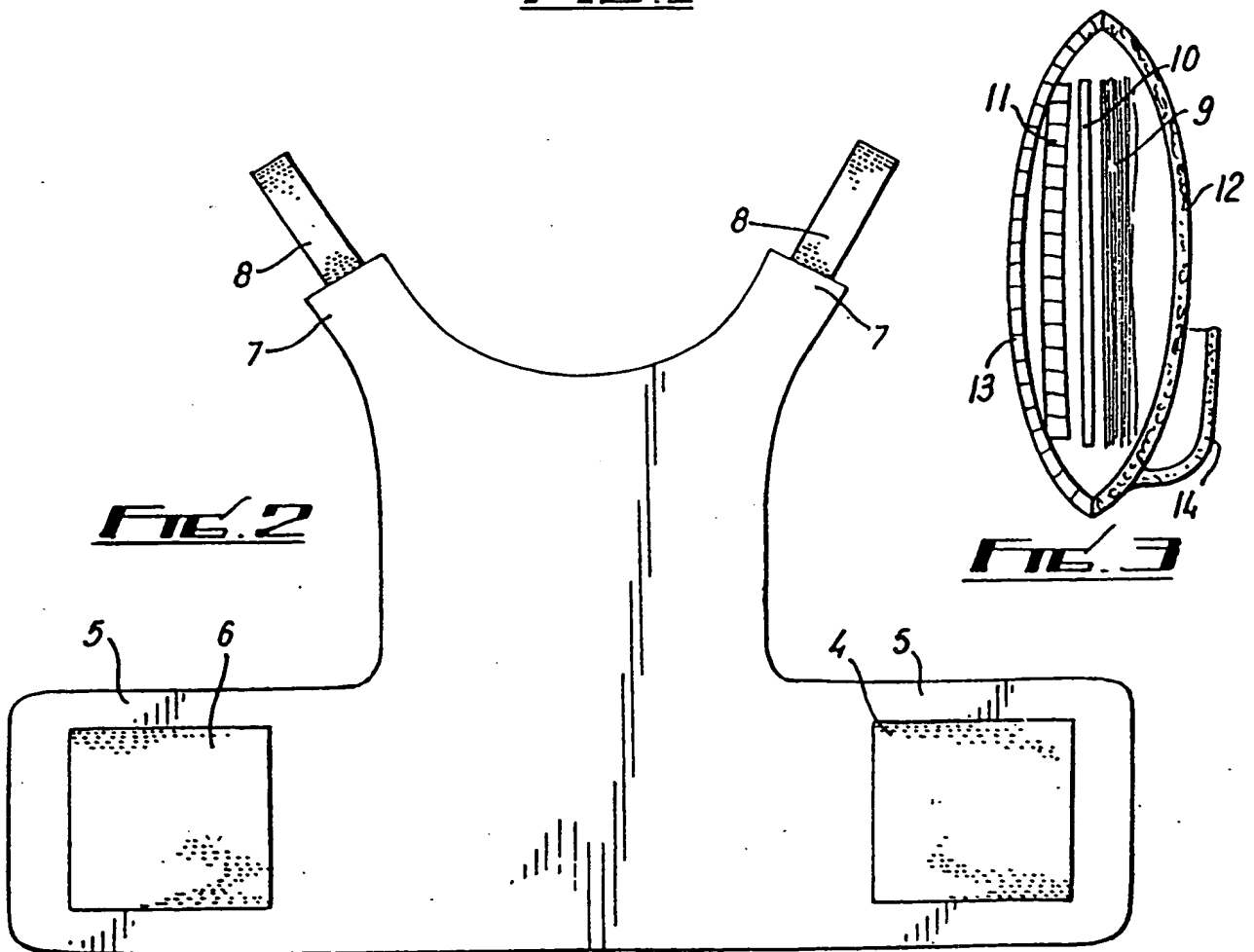
At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.  
The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

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**FIG. 1**



**FIG. 2**

**FIG. 3**

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PROTECTIVE GARMENTS

This invention relates to protective garments, particularly of the bullet-proof vest kind.

5 It is well known to construct bullet-proof vests from multiple layers of fabric woven from an aramid fibre which is sold by Du Pont under the trade mark Kevlar. As described in U.K. Patent 1556245 the layers may be backed by a trauma pack comprising a semi-rigid sheet of polycarbonate plastics accompanied by a sheet of foamed  
10 plastics material.

The aramid layers, and any trauma pack, are commonly enclosed in a bag contained within or forming part of a vest structure formed from a strong relatively impervious fabric such as a closely woven nylon, such vest  
15 structure in use being held releasably in place around a persons body using straps or the like.

With this known arrangement, although the vest is relatively light and comfortable compared with traditional metal or other rigid protective garments, the weight is  
20 not insignificant and this can be a problem in the case where protection is required by personnel on ships or in other environment when there is the possibility of falling into water wearing the garment. A further problem in this context can arise in so far as the vest can fill with  
25 water and may not permit ready drainage of such water therefrom.

One object of the present invention is to provide an effective bullet proof vest with which the above

mentioned problem can be eliminated or at least appreciably reduced.

According to a first aspect of the invention therefore there is provided a protection garment to be worn  
5 by a person comprising multiple layer of penetration-resisting fabric within an outer cover, characterised in that at last part of said cover is of open work construction so as to be capable of permitting free drainage of water therethrough, and at least one sheet of  
10 buoyant material is included within said cover alongside said fabric layers.

The layers may be formed from aramid fabric and may be backed with a trauma pack for example as described above.

15 In U.K. patent 2061089 there is described a bullet proof vest having a ceramic plate detachably mounted at the front thereof, such plate providing additional protection of value for example in the case of threat by high velocity bullets.

20 A further object of the present invention is to provide a protective garment having a supplementary rigid shield member detachably mounted at the front thereof and which can be removed and attached as desired in a quick and convenient manner.

25 According to a second aspect of the invention therefore there is provided a protective garment to be worn by a person comprising multiple layers of penetration-resisting fabric within an outer cover, and

having a rigid shield member detachably mounted at the front characterised in that the cover has in a lower region of the front thereof an open topped pocket in which the shield member fits with a major part of the shield projecting upwardly therefrom.

The said layers may be formed from aramid fabric and may be backed with a trauma pack for example as described above.

The rigid shield member may comprise a ceramic plate and this may be backed by one or more sheets of reinforcing material such as aramid fabric which may be bonded thereto, for example as described in U.K. patent 2061089.

The second aspect of the invention may be used in combination with the first aspect.

The invention will now be described by further way of example only and with reference to the accompanying drawings in which:-

Fig 1 is a diagrammatic view of the front part of one form of a vest according to the invention,

Fig 2 is a diagrammatic view of the back part of the vest,

and Fig 3 is diagrammatic sectional view to a smaller scale, of the front part of the vest.

The vest has a shaped front part (Fig 1) which fits over of the upper region of the front of a person's body. The vest also has a back part (Fig 2) which fits over the upper region of the back of the person's body. The two

parts are held together thereby to hold the vest in position by interconnection of Velcro<sup>(RTM)</sup> fasteners on the two parts. More specifically, the front part has Velcro fastener strips 1 on upper shoulder portions 2, and further narrower fastener strips 3 beneath these, and a rectangular Velcro fastener panel 4 across the lower region of the front part. The back part has side flaps 5 with Velcro fasteners panel 6 and shoulder straps 7 with Velcro fasteners strips 8. The strips 7 pan over the wearer's shoulders and the fastener strips 8 attach to the strips 1 and also can attach to the strips 3. The flaps 5 wrap round the wearer's side and the fastener panels 6 attach to the panel 4.

The front part, as shown in Fig 3 is in the form of a bag which contains multiple lsyers 9 (eg 8 to 30) of Kevlar<sup>(RTM)</sup> woven fabric sheets backed by a trauma pack 10 comprising one or more thin flexible semi-stiff polycarbonate sheets and one or more resiliently compressible foamed plastics sheets (eg foamed cross-linked polythene such as that sold under the trade name plastizote or Evazote). In addition to the above mentioned layers there is one or more further layers of a buotancy material.

Such as a foamed plastics sheet which may be of the same kind as or different from the above mentioned foam sheet of the trauma pack 10.

The various layers may be retained in position solely by the bag forming the front part. Alternatively,

the layers, or some of them may be contained in one or more inner bags within the outer bag of this front part.

The front part is formed from front and back sheets 12, 13 seamed together around their edges. The front sheet 12 is a strong relatively impervious nylon fabric. The back sheet 13 in a strong open mesh/nylon fabric.

Where the internal layers are contained within one or more inner bags, these may be sealed and formed from waterproof materials or alternatively may be formed at least partially from open mesh fabrics.

The back part may be formed in like manner to the front part.

With the arrangement so far described, should the wearer fall into water, the vest will not unduly hinder floating and will not unduly prevent the person from climbing out of the water insofar as the buoyancy sheet 11 acts to counter at least partially the weight of the vest, and water entering the interior of the front and back parts of the vest can readily flow therefrom through the open mesh fabric sheet 13.

The fastener panel 4 or the front part is mounted on the front of a rectangular fabric panel 14 which is fixed in position around its bottom and two side edges thereby to define a shallow open-topped pocket. As indicated in Fig 1 a rigid shield member 15 can be inserted into this pocket so that a major part of the member projects upwardly over the front part.

The rigid shield member comprises a ceramic plate

backed with aramid fabric sealed within a bag. The bag has two Velcro fastener strips at the top edge and these lie over the strips 3 on the front part. Thus, when the shield member 15 is in position in the pocket, the strips 8 on the shoulder straps 7 attach to the strips 2 and the strips on the inserted member 15 rather than the strips 3.

With this arrangement it will be appreciated that the rigid member 15 can be inserted and removed as desired in a particularly quick and convenient manner.

It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiment which are described by way of example only.



CLAIMS

1. A protective garment to be worn by a person comprising multiple layers of penetration-resisting fabric within an outer cover, characterised in that at least part of  
5 said cover is of open-work construction so as to be capable of permitting free drainage of water therethrough, and at least on sheet of buoyant material is included within said cover alongside said fabric layers.
2. A garment according to claim 1 wherein the  
10 penetration-resisting fabric comprises aramid fabric.
3. A garment according to claim 1 or 2 wherein the penetration-resisting fabric is backed with a trauma pack.
4. A garment according to claim 3 wherein the trauma pack comprises a semi-rigid sheet of polycarbonate plastics  
15 accompanied by a sheet of foamed plastics material.
5. A protective garment to be worn by a person comprising multiple layers of penetration-resisting fabric within an outer cover, and having a rigid shield member detachably mounted at the front characterised in that the cover has  
20 in a lower region of the front thereof and open topped pocket in which the shield member fits with a major part of the shield projecting upwardly therefrom.
6. A garment according to claim 5 wherein the penetration-resisting fabric comprises aramid fabric.
- 25 7. A garment according to claim 5 or 6 wherein the penetration-resisting fabric is backed with a trauma pack.

8. A garment according to claim 7 wherein the trauma pack comprises a semi-rigid sheet of polycarbonate plastics accompanied by a sheet of foamed plastics material.

9. A garment according to any one of claims 5 to 8  
5 wherein the rigid shield comprises a ceramic plate.

10. A garment according to claim 9 wherein the ceramic plate is backed by one or more sheets of reinforcing material.

11. A garment according to claim 10 wherein the reinforcing  
10 material is bonded to the ceramic plate.

12. A garment according to claim 10 or 11 wherein the reinforcing material comprises aramid fabric.

13. A garment according to any one of claims 5 to 12  
15 4. which is a garment according to any one of claims 1 to

14. A garment substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.